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IN THE UNITED STATES
PATENT AND TRADEMARK OFFICE

Patent Application

Inventors(s):	George Earl Peterson	**Case:**	18
Serial No.:	09/915,963	**Filing Date:**	July 26, 2001
Examiner:	Shih Chao Chen	**Group Art Unit:**	2821
Title:	Broadband Polling Structure		

THE COMMISSIONER OF PATENTS AND TRADEMARKS
WASHINGTON, DC 20231
SIR:

Enclosed is an **Appeal Brief** (in triplicate) in the above-identified application.

The appeal brief fee of **$330**, as required by 37 CFR §1.17(c), may be charged to my **MASTERCARD** (Form 2038 attached).

In the event of any non-payment or improper payment of a required fee, the Commissioner is authorized to charge or to credit my MASTERCARD as required to correct the error.

Respectfully,

Michael J. Urbano

Michael J. Urbano
Attorney for Applicant(s)
Reg. No. 24, 522
610-691-7710

Date: 04/14/04

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I hereby certify that this amendment is being deposited with the U.S. Postal Service "Express Mail Post Office to Addressee" service under 37CFR1.10 on the date indicated above and is addressed to the Commissioner of Patents and Trademarks, Washington, DC.

Michael J. Urbano: Michael J. Urbano

**IN THE UNITED STATES
PATENT AND TRADEMARK OFFICE**

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**THE COMMISSIONER OF PATENTS AND TRADEMARKS
WASHINGTON, DC 20231**

SIR:

APPEAL BRIEF UNDER 37 CFR § 1.192

I. Real Party In Interest

The real party in interest is Lucent Technologies Inc., 600 Mountain Avenue, PO Box 636, Murray Hill, NJ, 07974-0636.

II. Related Appeals and Interferences

There are no related appeals or interferences.

III. Status of the Claims

Claims Extant: Claims 1-25 are now in this case.

Claims Rejected: Claims 1-3, 5-13, 15-19, 21 and 23-25 stand finally rejected. More specifically, (A) Claims 2 and 12 have been rejected under 35 USC §112, first paragraph, as failing to comply with the enablement requirement; (B) Claims 1, 3, 5-9, 11, 13 and 15-18 have been rejected under 35 USC §102(e) as being anticipated by Wicks *et al.*, US Statutory Invention Registration No. H2016H published on April 2, 2002 (hereinafter *Wicks*); and (C) Claims 10, 19, 21 and 23-25 have been rejected under

35 USC §103(a) as being unpatentable over Wicks in view of Ogot *et al.*, US Patent No. 5,648,787 issued on January 15, 1997 (hereinafter *Ogot*).

Claims Allowable: Claims 4, 14, 20 and 22 have been objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in dependent form including all of the limitations of the base claim and any intervening claims.

Claims on Appeal: Claims 1-3, 5-13, 15-19, 21 and 23-25 are on appeal.

IV. Status of Amendments

No amendments were filed subsequent to the second final Office action dated November 19, 2003.

V. Summary of the Invention

Applicant's antenna structure [100, FIG. 2(a); 200, FIGs. 4(a) and 4(b)] operates over a wide frequency spectrum and offers wider directivity than endfire-type devices (10, FIG. 1), which makes the invention better suited to polling applications (page 7, lines 1-5; page 9, lines 24 *et seq.*). Applicant recognized that the narrow directivity of tapered slot antennas is attributable to the phase velocity supported by the antenna's dielectric substrate (page 2, lines 18-20).

In accordance with one embodiment of the present invention, Applicant's antenna structure supports a phase velocity greater than the speed of light (page 2, lines 21-22; page 7, lines 9-10; FIG. 2).

In another embodiment of the present invention, Applicant's antenna structure comprises a tapered antenna element [110, FIGs. 2(a) and 2(b); FIG. 3; 210 and 215, FIGs. 4(a) and 4(b)] coupled with a symmetrically shaped finite ground plane [page 2, lines 23-24; 125, FIGs. 2(a) and 2(b); 225, FIG. 4(a)], which supports the relatively wider directivity of the broadband structure (page 7, lines 22-23; page 10, lines 6-7).

Advantageously, the symmetrical finite ground plane is disk-like shaped, although other symmetrical shapes may also be employed (page 7, lines 23-25; page 10, lines 7-11). The disk-shaped ground planes 125 and 225 of FIGs. 2(a) and 4(a) each exhibits symmetry around the vertical axis, which runs axially through conductors 115 and 234,

respectively. Equivalently, these disk-shaped ground planes can be seen to have symmetry with respect to all planes that are perpendicular to the disk and include its center.

The tapered antenna element is positioned at an angle from the ground plane, which may advantageously be 90 degrees (page 2, lines 24-26; page 8, lines 21-23). The taper affords Applicant's antenna structure with wide frequency bandwidth (page 7, lines 15-16; page 10, lines 16-18. The taper may have a variety of shapes (FIG. 3; page 9, lines 1-20).

Illustratively, the tapered antenna elements are *flag* elements of the type depicted by element 110 of FIGs. 2(a) and 2(b) and elements 210 and 215 of FIGs. 4(a) and 4(b). These elements have *fast wave* characteristics (page 10, lines 23-26).

VI. Issues Presented for Review

Issue A: Whether Claims 2 and 12 satisfy the enablement requirement of 35 USC §112, first paragraph.

Issue B: Whether Claims 1, 3, 5-9, 11, 13 and 15-18 are patentable over Wicks under 35 USC §102(e).

Issue C: Whether Claims 10, 19, 21 and 23-25 are patentable over Wicks under 35 USC §103(a).

VII. Grouping of Claims

As to the 35 USC §112 rejection, Claims 2 and 12 are in a first group.

As to the 35 USC §102(e) rejection, Claims 1, 3, 5-9, 11, 13 and 15-18 are in a second group.

As to the 35 USC §103(a) rejection, Claims 10, 19, 21 and 23-25 are in a third group.

In each of the second and third groups the Claims do *not* stand or fall together. As indicated in Section VIII, Argument, *infra*, the Claims of each of the second and third groups are believed to be separately patentable.

VIII. Argument

Issue A: In paragraphs 1-2 of the second final Office action dated November 19, 2003, Claims 2 and 12 have been rejected under 35 USC 112, first paragraph, as failing to comply with the enablement requirement. The Examiner states his position as follows:

> The claims(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art ... to make and/or use the invention. Despite applicant's disagreement, it remains the examiner's position that the limitation defining "the phase velocity being greater than the speed of light" still defies conventional theory of physics.

This rejection is respectfully traversed for a number of reasons.

The law of enablement under Section 112 is clear. The Federal Circuit has defined the threshold test as follows:

> When rejecting a claim under the enablement requirement of Section 112, the [Patent Office] bears an initial burden of setting forth a reasonable explanation as to *why* it believes that the scope of protection provided by the claim is not adequately enabled by the description of the invention provided in the specification of the application; this includes, of course, providing *sufficient reasons* for doubting any assertions in the specification as to the scope of enablement. *In re Wright*, 999 F.2d 1557, 27 USPQ2d 1510, 1513 (Fed. Cir. 1993). (Emphasis added.)

To make out a *prima facie* case of nonenablement authorities state that the Examiner must provide, *inter alia*, a rational basis as to why the disclosure does not teach, or why to doubt the objective truth of the statements in the disclosure that purport to teach the manner and process of making and using the invention. Donner, *Patent Prosecution: Practice & Procedure Before the US Patent Office*, 949 (3d Ed. 2003).

First, the nonenablement rejection is fatally defective because it fails to provide

Applicant with basic due process. The Examiner has not specified what *conventional theory of physics* he is relying on, and he has provided *no scientific authority* defining that theory and supporting his position.

Second, the Examiner's cursory comments provide not even the slightest hint as to why he rejects the numerous authorities cited by Applicant in support of the fact that a phase velocity in excess of the speed of light is well known and does not violate any *conventional theory of physics*.

From the first and second reasons it is clear that the Examiner has failed to make out a *prima facie* case of nonenablement.

Third, let us assume, *arguendo*, that the Examiner is relying on some notion that the speed of light (*c*) is the upper bound on the speed at which things (e.g., physical objects, electromagnetic waves) can travel through space. If so, the Examiner has either misunderstood or misapplied basics physics principles as they relate to the *phase velocity* of an electromagnetic wave.

These basic physics principles are notoriously well known in the art. For example, the Board's attention is directed to the "Mathpages" Internet website at http://www.mathpages.com and, in particular, to the "Physics" section entitled "Phase, Group, and Signal Velocity." Copies of pages 1-6 of that section were attached to Applicant's response of September 10, 2003. Not only does Mathpages clearly define these three wave velocities, but also it clearly states that phase velocity is *not* limited by the speed of light; to wit:

(1) Page 2, lines 17-20: *Since a general wave (or wavelike phenomenon) need not embody the causal flow of any physical effects, there is (sic) obviously there is no upper limit on the possible phase velocity of a wave*; and

(2) Page 4, lines 7-8: *It is quite possible for the phase velocity...to exceed the value of c, because it conveys no information* (in the case of a perfectly monochromatic wave of light); and

(3) Page 4, lines 27-28: *Hence, not only is the phase velocity generally*

> *greater than c, it approaches infinity as ω approaches the cutoff frequency ω_0* (in the case of a hollow magnetic conductor, often called a waveguide).

Although these citations from Mathpages should suffice to convince the Board that the phase velocity of a wave can exceed the velocity of light without violating any "conventional theory of physics," Applicant submited two additional authorities both of which corroborate this fact: (i) J. D. Kraus, *Antennas*, 2nd Edition, McGraw Hill, Inc., New York (1988), pp. 231, 291-293, and 759-760; and (ii) O. D. Jefimenco, *Electricity and Magnetism*, 2nd Edition, Electret Scientific Company, Star City (1989), p. 553. Copies of these pages of Kraus and Jefimenco were also attached to Applicant's response of September 10, 2003.

(1) Jefimenko, page 553, lines 23-27: *It is interesting to note that the velocity with which these waves propagate, or their phase velocity...is $v_p = c/\sin\theta$ and thus is greater than the velocity of light* (in the case of reflection at an angle θ from a conducting surface); and

(2) Kraus, page 291, Figure 7-26, shows that the relative phase velocity p can have values greater than one, where $p = v/c$ and v is the velocity along a conductor of a helical antenna; and

(3) Kraus, page 293, Figure 7-28, also shows that the relative phase velocity p can have values greater than one, where $p = v/c$ and v is the velocity along a conductor of a helical antenna; and

(4) Kraus, page 760, lines 11-12, provides an example where $v = 1.5c$ (in the case of a leaky waveguide antenna).

Mathpages, Kraus and Jefimenco are but three of many references that could be cited in support of the same principle. Accordingly, it should be apparent that electromagnetic waves having a phase velocity greater than the speed of light are notoriously well known in the art and do not violate any "conventional theory of physics."

Fourth, based on the foregoing discussion the Board is respectfully requested to take *judicial notice* of these references in establishing that electromagnetic waves having a phase velocity greater than the speed of light do not violate any "conventional theory of physics."

Fifth, Applicant's specification is replete with examples that teach one skilled in the art how to make antenna elements that have *fast wave* characteristics (specification, e.g., page 10, lines 12-26; FIG. 3). As pointed out in Applicant's response of July 11, 2002, the phase velocity of a fast wave is greater than the speed of light, citing Kraus, *supra*, at pp. 760-762.

Sixth, in paragraph 9 (Response to Arguments) of the second final Office action dated November 19, 2003, the Examiner for the *first* time raises the issue of the absence of a *positive limitation* as follows:

> Applicant argues that a traveling wave antenna supporting a phase velocity greater than the speed of light (*sic*). This argument is not deemed to be persuasive because the recitation that a traveling wave is "supporting" to perform a given function is not a positive limitation but only requires the ability to so perform. It does not constitute a limitation in any patentable sense.

The use of the verb *to support* in the context of electronic or optoelectronic elements in which electromagnetic radiation or waves propagate (e.g., antennas, waveguides, resonators) is notoriously well known in the art. The Commissioner has sanctioned the use of such language in patent claims. See, for example, column 12, lines 4-6 of claim 1 of US Patent No. 6,134,257, where a resonator is said to *support at least one librational mode* (a form of electromagnetic radiation) and column 8, lines 26-27 of claim 1 of US Patent No. 6,301,282, where a radiation-guiding interface is said to *support surface plasmons* (a form of electromagnetic radiation).

Therefore, it is respectfully submitted that Applicant's claims 2 and 12 satisfy the enablement requirement of 35 USC 112.

Moreover, inasmuch as these claims have not been rejected based on any prior art, it is respectfully submitted that they are patentable over the prior art of record.

Issue B: In paragraphs 3-4 of the second final Office action dated November 19, 2003, Claims 1, 3, 5-9, 11, 13 and 15-18 were rejected under 35 USC 102(e) as being anticipated by Wicks.

This rejection is respectfully traversed.

Regarding Claim 1, the Examiner's position is as follows:

> Wicks et al. teaches in figures 1-5 an antenna structure comprising: at least one antenna element [mono-blade antenna element], that at least one antenna element having at least one taper (See Figures 4-5); and a symmetrical finite ground plane [ground plane] coupled with the at least one antenna element [mono-blade antenna element].

The law of anticipation under Section 102 is clear, as set forth in MPEP 2131: "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). "The identical invention must be shown in as complete detail as is contained in the ... claim." *Richardson v. Suzuki Motor Co.*, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989). Each and every element of Applicants' claims is not found in Wicks, as discussed below.

Lack of Symmetrical Finite Ground Plane

A careful reading of Wicks makes it clear that he fails to teach a *symmetrical* finite ground plane., as required by Claim 1, lines 6-7. More specifically, in Figures 1 and 2a of Wicks the one-dimensional ground plane is shown schematically as a horizontal line, which is a typical depiction of an *infinite* ground plane. On the other hand, in Figure 4 of Wicks the ground plane is depicted in three-dimensions as an irregular plate, with the cut-away view again suggesting an *infinite* ground plane. Wicks provides no teaching regarding the shape of the ground planes of Figures 1, 2a and 4, and likewise provides no indication whatsoever that the ground planes are symmetrical. Lastly, in Figure 5 of Wicks the ground plane is depicted in three-dimensions as a rectangular plate. There are several

reasons why this plate is not a symmetrical finite ground plane as called for by Claim 1, lines 6-7. First, the schematic rendering of the plate of Figure 5 measures approximately 4" x 2.75", a ratio of 16:11, which is clearly rectangular and not symmetrical. Second, even if we assume, *arguendo*, that the specific dimensions of the figure were not intended to be the actual dimensions (nor the ratio of such dimensions) of an operating embodiment, we are still left with the fact that Wicks is totally silent on the requirement of symmetry. Third, and perhaps most importantly, note that Wicks addresses the problems of *aircraft* communications antennas. It is well known in the art that in such aviation environments *the ground plane is the body of the aircraft*, which means that the schematic renderings of the ground plane in Figures 1, 2a, 4 and 5 provide no indication of symmetry. Rather, Wicks as a whole tells one skilled in the art that the ground plane is the aircraft body, and that body is not symmetrical as called for by Claim 1 and as defined by Applicant's specification.

In paragraph 9 (Response to Arguments) of the second final Office action of November 19, 2003, the Examiner addresses the issue of symmetry in the following fashion:

> Applicant argues that the Wicks et al. patent lack of (*sic*) fails to teach or reasonably suggest a symmetrical finite ground plane. This argument is not deemed to be persuasive because Wicks et al. teaches in figure 5 the ground plane as a finite ground plane with *4 axis* (*sic*) *of reflection symmetry*, the other figures depicting this ground plane are showing it in abbreviated form for convenience only, figure 5 is the actual ground plane. (Emphasis added.)

The Examiner's Response to Arguments is *inaccurate* because Wicks is totally devoid of any teaching that the ground plane shown in Figure 5 is symmetrical. In addition, Applicant objects to the Examiner's use of the phrase "4 axis of reflection symmetry" for two reasons: (1) the Examiner has not defined the phrase, and (2) the Examiner used this phrase for the *first* time in the second final Office action, thus not affording Applicant a full opportunity to develop the issues.

Accordingly, it is respectfully submitted that Wicks do not anticipate Claim 1.

Independent Claims 11 and 21 also require a symmetrical finite ground plane, and for the reasons set forth above are not anticipated by Wicks.

Parabolic Profile

Regarding dependent Claim 3, the Examiner argues that Wicks teaches in figures 1-5 the antenna structure wherein the taper comprises a *parabolic profile*. This argument, however, conflicts with the explicit teaching of Wicks; to wit, the only description of the shape of the lower curved edge of his mono-blade antenna element appears at column 3, lines 17-44. In this section, Wicks clearly states that each curved segment (e.g., B to C, and C to D) constitutes *an arc of constant radius* (col. 3, lines 24-25). Since, an arc of constant radius defines a portion of a circle, it is clear that Wicks fails to teach or suggest that the curved segments of his antenna element are parabolic.

Accordingly, it is respectfully submitted that Wicks does not anticipate Claim 3.

Dependent Claim 13 also includes a parabolic profile, and for the reasons set forth above is not anticipated by Wicks.

Phase Velocity Greater than the Speed of Light

We note again for the record that Claims 2 and 12 have not been rejected based on any prior art. Nevertheless, Applicant respectfully points out that Wicks fails to teach that the antenna structure is a *traveling wave antenna supporting a phase velocity greater than the speed of light.* In fact, Wicks *teaches away* from this feature of the invention; to wit, at column 2, lines 66-67 Wicks specifically teaches that the *slot transmission line has a TEM mode of propagation*. As noted in Applicant's July 11, 2002 traversal of the Section 112 rejection in the first Office action of April 18, 2002, a TEM wave (or mode) is a *slow wave*, which means that its phase velocity is *less than* the speed of light, *not greater than* the speed of light as required by Claims 2 and 12. (See, Kraus, *supra*, p. 760 for a discussion of fast and slow waves.)

Issue C: In paragraphs 5-6 of the second final Office action of November 19, 2003, Claims 10, 19, 21 and 23-25 were rejected under 35 USC 103(a) as being unpatentable over Wicks, *supra*, in view of Ogot *et al.*, US Patent No. 5,648,787 (hereinafter *Ogot*). The Examiner states his position as follows:

> Wicks et al. teaches every feature of the claimed invention in paragraph 4 except for the symmetrical disk-shaped finite ground plane.
>
> Ogot et al. teaches in figure 3A the symmetrical disk-shaped finite ground plane [210, 250].
>
> It would have been obvious...to substitute the metal ground plane as shown in Wicks et al. by using the symmetrical disk-shaped finite ground plane as taught by Ogot et al. in order to maximize the surface area of the ground plane perpendicular to the transmission element, and provides a uniform transmission pattern (See, col. 4, lines 66-67 and col. 5, lines 1-3).

This rejection is respectfully traversed.

Applicant respectfully disagrees that Wicks "teaches every feature of the claimed invention in paragraph 4 except for the symmetrical disk-shaped finite ground plane" for the reasons discussed with respect to Issue B, *supra*, and incorporated herein by reference.

In addition, Wicks describes a *broadband* antenna (col. 1, line 11), which works best with a relatively large ground plane. Applicant has pointed out, *supra*, that Wicks relates to aircraft antennas in which the fuselage is the ground plane, which means that the Wicks ground plane is much larger than the antenna elements. In contrast, Ogot describes a radar antenna in which the diameter of a circular ground plane is between $\lambda/8$ and $\lambda/4$ (col. 3, lines 20-23; col. 4, lines 61-64; col. 5, lines 11-21). By design, therefore, once the diameter of the Ogot ground plane is set to satisfy one wavelength, it cannot simultaneously satisfy the same requirement for a wide range of wavelengths; e.g., it cannot simultaneously satisfy the $\lambda/8$ to $\lambda/4$ requirement over the *many octaves of bandwidth* demanded by the Wicks antenna (Abstract, line 2). It is clear, therefore, that Wicks and Ogot teach *away* from one another and that one skilled in the art would not be motivated to substitute the Ogot narrow band circular disk ground plane for the Wicks

broadband ground plane.

Accordingly, it is respectfully submitted that the combination of Wicks and Ogot fail to render obvious Applicant's Claims 10, 19, 21 and 23-25.

IX. Conclusion

In summary, it is respectfully submitted that (1) Claims 2 and 12 satisfy Section 112, and (2) Claims 1-3, 5-13, 15-19, 21 and 23-25 are neither anticipated by Wicks nor rendered obvious by the proposed combination of Wicks and Ogot.

Accordingly, reversal of the final rejection is in order.

X. Appendix

The Claims under appeal are in Appendix A.

Respectfully,
George Earl Peterson

By Michael J Urbano

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Date: 04/14/04

Att.
Appendix A

APPENDIX A

Claims on Appeal

1. An antenna structure comprising:

at least one antenna element, the at least one antenna element having at least one taper; and

a symmetrical finite ground plane coupled with the at least one antenna element.

2. The antenna structure of Claim **1**, wherein the at least one antenna element comprises a travelling wave antenna supporting a phase velocity greater than the speed of light.

3. The antenna structure of Claim **1**, wherein the taper comprises a linear profile, a linear constant profile, a broken-linear profile, an exponential profile, an exponential constant profile, a tangential profile, a step-constant profile, or a parabolic profile.

5. The antenna structure of Claim **1**, wherein the at least one antenna element is positioned at an angle from the symmetrical ground plane.

6. The antenna structure of Claim **5**, wherein the angle is about 90 degree with respect to the **x-**, **y-** and **z-** axes.

7. The antenna structure of Claim **1**, wherein the at least one antenna element is coupled with the symmetrical ground plane by means of an unbalanced impedance.

8. The antenna structure of Claim **7**, wherein the unbalanced impedance comprises a coaxial cable.

9. The antenna structure of Claim **7**, wherein a first conductor of the unbalanced impedance mechanically couples the at least one antenna element with the symmetrical ground plane.

10. The antenna structure of Claim **1**, wherein the symmetrical ground plane is disk shaped.

11. An antenna structure comprising:

an array of at least two antenna elements, each antenna element having at least one taper;

a symmetrical finite ground plane; and

an unbalanced impedance for coupling the array of at least two antenna elements with the symmetrical ground plane.

12. The antenna structure of Claim **11**, wherein at least one antenna element of the array comprises a travelling wave antenna supporting a phase velocity greater than the speed of light.

13. The antenna structure of Claim **11**, wherein the taper of at least one antenna element of the array comprises a linear profile, a linear constant profile, a broken-linear profile, an exponential profile, an exponential constant profile, a tangential profile, a step-constant profile, or a parabolic profile.

15. The antenna structure of Claim **11**, wherein each antenna element of the array is positioned at an angle from the symmetrical ground plane.

16. The antenna structure of Claim **15**, wherein the angle for each antenna element is about 90 degree with respect to the **x**-, **y**- and **z**- axes.

17. The antenna structure of Claim **11**, wherein the unbalanced impedance comprises a coaxial cable.

18. The antenna structure of Claim 17, wherein a first conductor of the unbalanced impedance mechanically couples each antenna element of the array with the symmetrical ground plane.

19. The antenna structure of Claim **11**, wherein the symmetrical ground plane is disk shaped.

21. An apparatus comprising:

a transceiver; and

an antenna structure for radiating or capturing electromagnetic energy from or to the transceiver comprising:

at least one antenna element having at least one taper, the taper comprising a linear profile, a linear constant profile, a broken-linear profile, an exponential profile, an exponential constant profile, a tangential profile, a step-constant profile, or a parabolic profile;

a symmetrical disk shaped finite ground plane, the at least one antenna element being positioned at an angle from the symmetrical disk shaped finite ground plane; and

an unbalanced impedance for coupling the at least one antenna element with the symmetrical disk shaped finite ground plane.

23. The antenna structure of Claim **21**, wherein the angle is about 90 degree with respect to the **x**-, **y**- and **z**- axes.

24. The antenna structure of Claim **21**, wherein the unbalanced impedance comprises a coaxial cable.

25. The antenna structure of Claim **21**, wherein a first conductor of the unbalanced impedance mechanically couples the at least one antenna element with the symmetrical ground plane.